REMARKS

Claims 1-33 currently remain in the application. Claims 1, 5-10 and 12-14 have been amended. Claims 19-33 have been added.

Applicant believes the new claim amendments do not add new matter. Claim 1 as amended now recites "wherein the polymer layer is arranged in a manner which causes a portion of the polymer layer to deform in response to a change in electric field that is applied via at least one of the first compliant electrode layer or the second compliant electrode layer and wherein a portion of the polymer layer is capable of an elastic area strain of at least about 10% between a first position of the polymer layer with a first area and a second position of the polymer layer with a second area." In the current application, it states the present invention "differs from other electrostrictive devices that produce sound primarily by the changing the thickness of a polymer film (or stack of films) due to the electrostrictive effect. In contrast, our invention produces sound by using in-plane strains to induce out-of-plane deflection the film. The apparent stiffness and mass of a polymer film operating in this out-of-plane configuration can be orders of magnitude less than that for compression of the solid polymer as in other electrostrictive devices (Col. 3, 13-18 of the parent patent application now U.S. patent 6,343,129)." Further, the present application states (Col. 3, 39-47), "dielectric materials with the aforementioned properties (e.g. silicone rubbers) have produced strains over 25%. The literature describing electrostrictive polymer actuators using rigid electrodes does not show any material with an electrostrictive response of this magnitude. Further, electrostrictive materials do not necessarily have a large response in the in-plane directions and, therefore, cannot effectively make use of the out-of-plane deflection mode of operation." In addition, the present application states, "this material has developed over 30% strain in the two orthogonal in-plane directions. Such a strain corresponds to over a 69% increase in the film area (Col. 6, 29-33)." Thus, the present application supports the limitation "wherein a portion of the polymer layer is capable of an elastic area strain of at least about 10% between a first position of the polymer layer with a first area and a second position of the polymer layer with a second area." The elastic area strain refers to the change in area between the first position and the second position.

Rejections under 35 U.S.C. § 112

Claims 1-18 were rejected under 35 U.S.C. § 112, first paragraph. The term "non-metallic" has been deleted from the claims and the rejection is believed overcome thereby.

Claim 1 was rejected for lack of antecedent basis of the term "said sonic actuator film." Claim 1 has been amended and the rejection is believed overcome thereby.

Claims 5-10 and 12-13 were rejected for lack of antecedent basis of the term "said film." Claims 5-10 and 12-13 have been amended and the rejection is believed overcome thereby.

Double Patenting

Claim 1 has been amended to add the limitation "wherein a portion of the polymer layer is capable of an elastic area strain of at least about 10% between a first position of the polymer layer with a first area and a second position of the polymer layer with a second area." Applicant believes claims 1 and 15-18 are now patentably distinct from claims 1-2 of U.S. patent no. 6, 343, 129.

Rejections 35 U.S.C. § 103

Claims 1-3 were rejected under U.S.C. 103 (a) as being unpatentable over Whitehead, et al. (U.S. Patent 4,885,783).

Claims 1-6, 8-9, 13-16 were rejected under U.S.C. 103 (a) as being unpatentable over Micheron (U.S. patent 4,400,634) in view of Whitehead.

Claims 1-12 and 14 were rejected over Bobbio (U.S. patent 5, 206, 557) in view of Whitehead.

As discussed above, the present invention uses in-plane strains to induce out of plain deflections of the film (membrane). As recited in the pending claims, the elastic deformation of the polymer layer may result in a signification change in area of the layer as it deforms from a first position to a second position under the application of an electric field. The membrane may be capable of elastic area strains (changes in area) of at least about 10%.

In contrast, Whitehead describes an elastomeric material sandwiched between rigid metal plates (FIG. 2) where the plates are designed to oscillate (Col. 4, 10-28). The device is designed to measure or produce small displacements (Col. 8, 32-44). The electrodes are non-compliant as the polymer has surface irregularities and pockets that decrease the breakdown voltage of the device (Col. 5, 29-49). In Whitehead, large changes in the area of the elastomeric material during operation of the device are not described. It does not seem likely that large changes in the area of elastomeric material would occur in Whitehead as it is designed only to produce very small linear motions. Further, given that the electrodes in Whitehead are rigid and non-compliant, the electrodes would not expand as the area of the elastomeric material expands. Hence, it would not be possible to apply an electric field over the expanded area of the elastomeric material to produce large deformations. Therefore, the Whitehead can't be said to render obvious claims 1-3 and the objection is believed overcome thereby.

Micheron describes a biomorph transducer with polymer material sandwiched between to electrodes. When the polymer materials are constricted in a normal direction, the material

expands tangentially. However, the normal and tangential deformations are very small (Col. 2, 63-67). Large area changes of the material are not described. Figure 8 and 9, shows the transducer bending but no scale is provided for one to deduce the amount of area change of the device. Since Micheron states the normal and tangential deformations are very small, it seems that the area change of the polymer material as it bends from one position to another is likely to be much less than the 10% area strain cited in the limitation of claim 1. As described above, Whitehead also teaches small deformations and devices not designed to accommodate large changes in area of the elastomeric material. Therefore, the combination of Micheron and Whitehead, can't be said to render obvious the present invention and the rejection of claims 1-6, 8-9, 13-16 is believed overcome thereby.

Bobbio describes a micro-electromechanical transducer formed from strips of a dielectric material. The device may be applied as a micropostioner (Abstract). Table 1 (Col. 11) shows that the range of control of the device is on .4 micrometers or less. Bobbio notes drawings are not to scale (Col. 7, 63-64). Large area changes in the dielectric material are not described. The device is composed of an array of strips and spaces etched from a common dielectric material (Col. 8, 35-37). During a movement of the device, a force is generated that is applied to the spacers which is of the same material as the strips. The spacers under the force output by the device elongate by only 1% or less (.01 micrometer divided by 1 micrometer) (see Col 9, 65-10, 1). Thus, the material is relatively stiff and area changes during the operation of the device in Bobbio are small. Given the stiff material described in Bobbio and the small movements produced by the device, it is unlikely that materials in Bobbio change in area greater than 10%. As described above, Whitehead also teaches small deformations and devices not designed to accommodate large changes in area of the elastomeric material. Therefore, the combination of Micheron and Whitehead can't be said to render obvious the present invention and the rejection of claims 1-12 and 14 is believed overcome thereby.

In regards to claims **8-9** and **25**, Micheron or Bobbio do not teach an enclosed surface that would be required to produce a pressure gradient across the layers in their devices. The pressure gradient used to produce force biases the direction of movement of their devices. Examiner cites Figs. 9 and 10 in both Micheron and Bobbio as evidence of pressure biasing. Figs. 9 and 10 in Micheron do not show enclosed structures therefore it would not be possible to bias the material using a gas pressure, as it would be equal on both sides of the material. Figs. 9 in Bobbio show unenclosed cross-sections and there is not a FIG. 10 in Bobbio. Therefore, applicant does not see how a pressure gradient, such as a gas pressure above or below atmospheric pressure, could be applied in Bobbio for the purposes of biasing.

Applicant believes that all pending claims are allowable and respectfully requests a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

Respectfully submitted,
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